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*Radio Therapy*

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CHICAGO, U. S. A.



## IN THE TREATMENT OF

**ANÆMIA, NEURASTHENIA, BRONCHITIS, INFLUENZA,  
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# THE AMERICAN X-RAY JOURNAL

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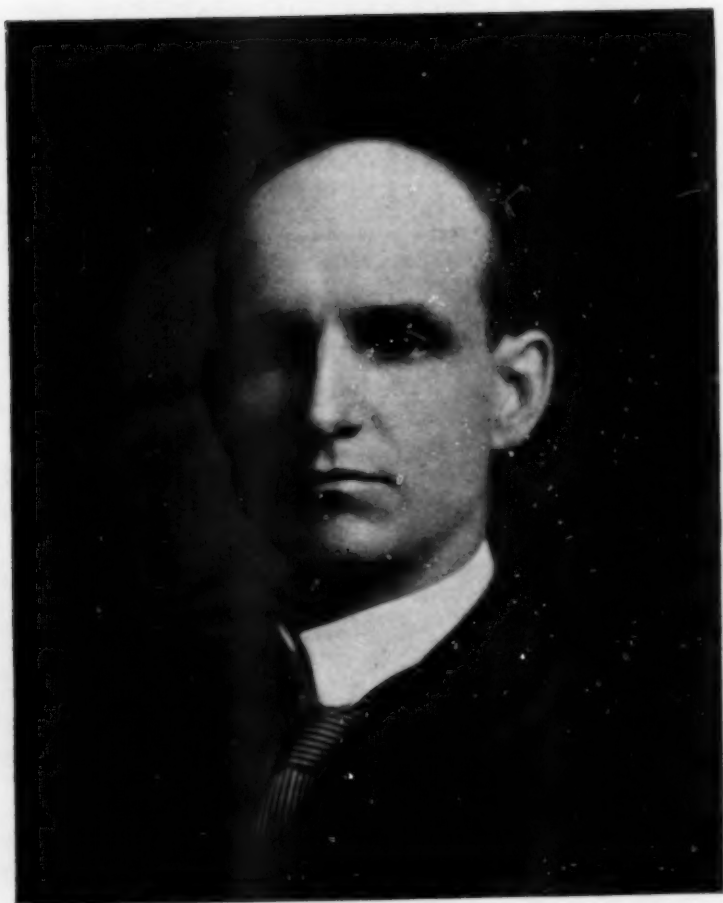
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DR. STUART JOHNSTONE  
President Chicago Electro-Medical Society

# THE AMERICAN X-RAY JOURNAL

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. XIV.

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## What is Electricity?

BY T. PROCTOR HALL, PH. D., M. D.,  
CHICAGO.

If I were to ask, "What is Four-fold Space?" or, "What is Dimethylamidoazobenzene?" or even "What is Harmony?" perhaps not very many of those present would be able to give a complete and satisfactory answer. Nor would it be possible for the best of teachers in a few minutes to give such an answer to any one of these questions as to make the subject clear to a five-year-old child. Before he can know anything of four-fold space he must be familiar with the principles of elementary geometry. Dimethylamidoazobenzene is to him worse than Greek until he has some knowledge of organic chemistry. Harmony is incomprehensible without some knowledge of music.

Any difficulty that may exist in answering the question "What is electricity?" is found either in the want of skill of the teacher or in some defect in the preliminary knowledge or in the want of capacity of the learner, and not in the subject itself. There is a popular idea that the nature of electricity is unknown, but this idea is entirely wrong. It is true that we do not know all about electricity. Neither do we know all about air or water; and we do not expect to ever know all about either of them. I am safe in saying that we know the nature of electricity quite as well as we know the nature of air or water, and in some respects better.

As a preliminary step let me call your attention to this list of all the things that are known to exist:

1. Matter.
2. Space.
3. Time.
4. Energy.
5. Spirit.

In the first class (matter) are included all the things that have weight or occupy space, from the largest of the suns to the tiniest fragment of an atom, and from the largest imaginable metal to the all-pervading intangible luminiferous ether. Matter can be transformed; it may take a multitude of different shapes; but it can not be created and can not be destroyed by human agency. So far as our powers go, it is eternal.

Is electricity a form of matter? It is not. Why? Because it has no weight and does not occupy space. It can not be changed into other forms of matter, nor can they be transformed into it. In spite of the fanciful speculations of some very prominent physicists, both in Europe and America, this answer is final and conclusive. Electricity is inseparably associated with matter, but it is not matter.

The second and third classes (space and time) are each so entirely different from everything else that it is unnecessary to do more than point out that they are both, so far as human powers go, uncreatable,

indestructible and eternal. Not even a crank has made the suggestion that electricity belongs to either of these two classes.

Energy is capacity for doing work. It is not force, and it is not motion. It is simply and solely the ability to do work. A bent bow has energy that the same bow unbent does not have. This is only another way of saying that a bent bow can do work that an unbent bow can not do. A rock on the top of a hill is capable of doing work (as it rolls down) which the same rock at the foot of the hill could not do. In other words, the rock at the top of the hill has energy on account of its position. A ball shot out of a cannon is able to do work which the same ball at rest could not do. The moving ball has energy of motion. These illustrations will make it clear that energy is something that a given portion of matter may gain or lose. But if energy is gained it is gained from some other portion of matter, for no energy is ever created. Nor is energy ever destroyed. Like matter, space and time, it is uncreatable and indestructible by human power.

Electricity is a form of energy. This statement might be objected to by some mathematicians who use the word "electricity" in a very restricted technical sense; but in the popular meaning of the word this statement is correct. Electricity is known to be a form of energy by these two facts: as often as a given amount of electricity is produced a certain amount of energy in some other form disappears, and when that electricity disappears an equal amount of energy appears in some other form.

Electricity is not spirit. Spirit is known by its capacity for receiving sensations and of becoming conscious. In the sense in which I use the word, which

is entirely apart from any theological doctrines, everyone who hears me is a spirit. Consciousness itself is not a permanent and indestructible thing. Like motion, it may appear and disappear, but the something which underlies consciousness, whatever that may be, the something which is sometimes conscious, and which retains its individuality thru successive periods of unconsciousness, this is what I mean by spirit. If spirit is different in its nature from everything else in the universe and if each of the other classes of things is by itself eternal, analogy would lead us to infer the same uncreatability and indestructibility of spirit also. In all the universe we find transformation, but not annihilation. If spirit is of its own kind, and all the other kinds are permanent in quantity, this, too, must be permanent in its totality.

Having found the class to which electricity belongs, and having, in consequence, some general notion of its nature, let us look into it a little more closely.

In physics, which is the science of energy, we have the following branches:

Mechanics, treating of the energy of masses.

Heat, the energy of oscillations and collisions among atoms.

Sound, the energy of waves of compression.

Radiation, ether waves and streams of electrons.

Electric currents, vortexes of atoms and ether.

Electric charges, ether strains.

Magnetism, ether strains (of another sort).

Gravitation, chemical energy, and a few other forms, whose exact character is not so well understood.

Regarding the general nature of electricity all electricians are practically



agreed, but when we come down to particulars there is considerable difference of opinion. In what follows, therefore, I do not claim to speak for any one but myself.

An electromotive force is any force that tends to produce an electric current. Wherever such a force exists the atoms in the vicinity are polarized and tend to be arranged in chains, like little bar magnets adhering end to end. Whether the atoms actually take on such a chain-like arrangement or not depends upon their conditions. The atoms may be combined with one another so firmly that such an arrangement is impossible without tearing them apart from each other. In this case the substance is called a nonconductor, and no electric current is possible. In another case, as in a piece of copper, the atoms are so freely moveable that they promptly assume the chain arrangement, and then if the chains form complete circuits all the atoms in the chain rotate, and this rotation is what we call an electric current. The polarizing and rotating force (electromotive force) may be applied at any part of a conducting circuit, and power may be conveyed along the atomic chains in either direction, in the same way it is conveyed by a shaft in a machine shop. So far as the mere transmission of power is concerned the direction of rotation of the atoms in the chains is indifferent.

There are in such chains only two possible directions of rotation, right handed or positive, and left handed or negative. If you stand beside a wire running north and south, in which there is an electric current flowing north, then looking to the north you have the atomic rotations right handed or positive. Turning toward the south you have the same rotations now left handed or negative. Every

electric current is at the same time both positive and negative, according to the point of view. A positive current going north is precisely the same thing as a negative current going south. In neither is there anything flowing along, either in or about the wire, unless it be energy, which may be conveyed in either direction or in both, by the rotations.

Having clearly in mind this concept of an electric current, it is easy to apply the common laws of mechanics and deduce the laws of electricity. These rotating chains of atoms behave in every instance just as they should be expected to behave. There is no more mystery about them than there is about the shafts, pulleys, belts and gears in a machine shop.

The amount of current in a wire is measured by the total amount of rotation per second in it. Ten atomic chains, each making a million turns per second, give the same amount of current (current intensity) as a million chains, each making ten turns per second. The practical unit of current is called the ampere, and is represented approximately by one million chains whose rotation is such that the surface of each atom moves with the velocity of light, a speed such that the atom would roll round the world seven times in a second.

These atomic rotations do not escape some resistance. The atoms of all bodies are in constant irregular motion, striking against each other. The energy of this motion is known as heat. When the rotating atoms collide with the rest or with each other they increase the velocity of this heat-motion. In other words, they raise the temperature of the conductor. Each time such a collision occurs there is a loss of some of the energy of the rotating chain that would otherwise be spent in increasing the rotary speed of the

chain. In silver, copper and other good conductors there is relatively little of the energy of a current lost in this way. The resistance of these metals is small, and, what is still more interesting, the resistance gets smaller as the metal is cooled. Cooling means decreasing the vibratory speed of the atoms. By and by a point would be reached (if the cooling were to continue) when the heat-motion would all have disappeared. This point is known as the absolute zero of temperature. Now if we mark down on paper ruled in little squares the resistance of silver at various temperatures, as low as possible, and then draw a curve thru these points, and do the same thing for several other metals, we find that all the curves meet at a point corresponding to the temperature  $-273^{\circ}$  C. and to resistance zero, indicating that at that temperature all irregular motions of the atoms and all resistance to electric currents would cease. When I tell you that the boiling point of liquid hydrogen is about  $-235^{\circ}$  C. you will see that physicists have actually reached a temperature that is within easy walking distance of the absolute zero.

In order to get a mental picture of the nature of an electric charge we may suppose that at some part of an electric circuit the conductor is replaced by a non-conductor such as air or glass. At the surface of the glass the atoms are turned a little by the electromotive force, but their elastic reaction then becomes as great as the electromotive force, and there is no further motion, the atoms remaining in the strained condition. In glass a little of the turn of the atoms at the surface is carried to the next atoms, and so on. In mica two or three times as much of the turn is passed on to the next atoms, and electricians therefore say that the dielectric power of mica is two or three

times as great as that of glass. The dielectric power of silver is nearly infinite, that is to say, the turn is conveyed from one atom of silver to another with perfect freedom.

This condition of strain at a surface is called an electric charge. Its characteristic is that it has an unfailing tendency to turn back to its former condition, and in so doing it makes a current. The charge produced by a positive current, the charge on that surface of the glass in which the rotation is right handed, is positive, and in untwisting produces a positive current from that place. The charge on the other side of the glass is negative or left handed, and produces a negative current. Both turns are in the same absolute direction, however, and if the glass is thin and the electromotive force is strong enough the force on each side helps the other to break the atoms from their attachments and forces them to rotate with violence. This pierces the glass, causes heat and strong ether waves (light). The whole action in that case is called an electric spark.

With this view of an electric charge it is easy for a mathematician to deduce from the known laws of energy the laws of attraction and repulsion of electric charges, laws which are made the foundation of the older electrical theories.

The luminiferous ether may be thought of as a soft elastic solid. When a chain of atoms in this ether rotates, the ether that is in contact with the atoms is dragged round a little way, and the strain extends outward in less and less degree from the chain. When the rotation ceases the ether drops back to its former place, and the strain disappears. This shearing strain about an electric current is magnetism. Magnetism, then, must always exist wherever there is an electric current; and it



may continue to exist after the current that excites it has ceased.

When the lines of atoms rotate first in one direction, positively, then negatively, the current is said to be alternating. From the sides of an alternating current proceed magnetic waves which resemble waves seen on the surface of water. Since these waves are not symmetrical in all directions about their line of advance from the current, they are called polarized waves. From the end of a row of conducting atoms proceeds a set of cylindrical waves. These are symmetrical about their line of advance, and answer to all the marks of waves of common light. A little reflection upon these two kinds of waves will convince you that the magnetic waves seem to be magnetic

only, and the others electric only, both sets are really electro-magnetic in character. If the ether in the magnetic or plane-polarized waves moves in an elliptical or a circular circuit the waves become elliptically or circularly polarized. All these kinds of light are well known to the physicist. The explanation I have just given of the nature of light is known as the electro-magnetic theory of light.

If you have followed my explanations up to this point you will see that having a clear concept of the nature of electricity the electrotherapist is not working in the dark in the use of this valuable agent, but is able to predict even in advance of clinical results the therapeutic effects of electric treatment.

### Electro Therapeutics.\*

BY D. A. STEVENS, M. D., CHICAGO.

The application of electrical currents for their direct and indirect influence upon diseased processes has now reached a stage of development, accuracy and certainty which demands for it the attention of every progressive practitioner. The time has passed when we can tell our chronic patients that there is nothing in electricity. They will think we are ignorant of its benefits, or manner of application, or that we belong to that rapidly passing type who think a stethoscope, obstetrical forceps and prescription book are all that is needed to attain success.

The field of the physician is constantly broadening; the so-called incurable diseases are one by one being eliminated from the list. In no one line or adjunct has there been such results shown as in electro-therapy. I do not except the great

work accomplished along the line of bacterial research. I am constrained to ask what the showing would be had we the same effort, time and number of the best men in the profession working along this line?

I wonder if we realize what is being done? With the whole profession worldwide investigating bacteria, toxins and serums, what have we curative to offer for all this labor? *Diphtheria*. In all the other diseases there is nothing certain to offer.

Now a few men, scattered widely, with little support from the profession at large, have so perfected the apparatus and technic that today we are curing all malignant growths which have good drainage and do not involve bone tissue. This alone would discount any other recent advance in the healing art, but with the confidence of a warrior battling for a

\*Read before the Illinois State Eclectic Medical and Surgical Society, May 30, 1904.

righteous cause we have met eczema in all of its manifestations, and it is ours. Favus has proven easy. Lupus has been treated with success. Even the great white plague, tuberculosis, in its incipient and early stages, responds satisfactorily, while tubercular glands in all stages are permanently reduced. The results in gynecological work have opened up a new page for women who do not wish surgical intervention.

I can not hope to touch upon this subject with any great thoroughness or detail in the short time allotted for this paper. But I want to make a plea for closer study and more accurate technic. Then, and then alone, can we expect results.

Where a case presents itself to you and you say you will try electricity, some vital points must be known before proceeding. First, What is the pathological lesion, status and condition of the patient? Second, What current, what pole, what dosage, frequency of application, and how apply? This will bring you to the point where the need of a fundamental knowledge of the whole subject will be realized. No one would think of getting uniform results from drug medication, without being cognizant of physiological action, dosage, therapy, indications and contra-indications. We must study and use electricity just as specifically. The promiscuous use of the faradic and galvanic currents without adequate knowledge of their indications can not be too strongly condemned. Never was the admonition to readjust ourselves to the advanced ideas in using this element so timely or uttered at a more opportune moment.

Not knowing that there were other papers upon this subject to be presented, I prepared a paper covering the field, as my subject would indicate, but upon receiv-

ing a program this last week I notice men with various divisions of the subject. So I made a motion to table my paper, then upon reconsideration sent it to the waste basket. About the only thing left for me was high frequency, which I will talk upon to the exclusion of the more familiar currents, which I think will receive better treatment under the presentation of the able exponents assigned for these subjects. Some go so far as to claim that this current supersedes all others as to therapeutic value. Certain it is that upon the continent the investigation and attention has been given largely to this H. F. C., the possibilities of which seem to be only touched upon. I hope the doctors will take up the paper and discuss it thoroly, that we may gain some ideas from each one, as the field is, in a large measure, unexplored, and we want the milestones marked out for those who follow.

The high frequency current of today is generally understood to be a current derived from a coil or static, with a step-up, or transformation coil, interposed. The ordinary current as derived from the static is a true high frequency current, but the term as used today, both in Europe and this country, refers to that current used by d'Arsonval and Oudin, and Tesla, of the States.

It may be obtained in many ways and in varying frequencies. It is *primarily* derived from the static machine, induction coil, commercial alternating current and Tesla coil. Of these sources of primary energy the first two are the ones we will most likely find in use. The high frequency current delivered to the patient will be the same in effect, generated by either agency. As is well known, the voltage of a static current is about 50,000 for the first inch of spark gap, reaching into the millions at its full capacity.

That this enormous voltage can be passed thru the human organism without apparent harm or sensation goes to prove that voltage is harmless without amperage.

This step-up, or increase in frequency, is obtained by passing the current thru a coil of coarse wire, which, after being insulated, is rewound with a second coil of fine wire. The lines of force from the primary coil being broken so many times by this secondary that we get an induced current of fabulous frequency and tension, so high, indeed, that, like waves of light that are too short to be recorded by the sight apparatus, so a sensory nerve capable of transmitting sensation at the rate of 20,000 per second becomes utterly incapable of transmitting a vibration or stimuli of many millions' frequency. So we can see why these currents cause no pain upon application, and the wonderful way in which they sedate pain is, I think, explained by the fact that the rapid vibration causes a temporary cessation of the function of nerve thru over-excitation.

This current is applied by means of vacuum glass electrodes of various forms to suit the uses for which intended. When lighted up by the current passing thru the vacuum, there is a beautiful violet glow, and a stream of visible vibrations of light or energy flows toward the distal extremity and centers upon whatever part of the tube is in contact with the patient.

The patient is not insulated, and one pole is usually grounded. There seems to be a preference for the negative pole for treatment, having a greater quantity of chemical rays and not being so harsh as the positive. However, the difference is not great. The electrode is placed in contact with the surface to be treated, and we notice moisture under the electrode very quickly. In a few minutes there is

active hyperemia present and some tingling and sense of warmth. Over sensitive areas we get quite an influence; over muscular action enough to cause a jerking of the head when treating the cervical region; contraction of eyelids when treating temporal or supra-orbital region; of the fingers when near the ends. The spark from the glass tubes seems to have most of the sting taken away, yet that the penetration is much greater than with other sparks is shown by the fact that it is transmitted thru glass and hard rubber. The non-conductors do not confine this current. Like the static currents which give us the brush discharge thru wooden electrodes (classed as a poor conductor even when damp), owing to the high voltage, so in the much greater voltage and frequency of the high-frequency current we are enabled to pass thru one-half inch or more of hard rubber. This great penetration would seem to disprove the generally accepted views that the effect of the high-frequency current was only superficial and useful only in skin diseases.

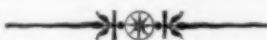
I think in this modality we are dealing with two distinct forces during its application: First, the chemical action whereby the passage of energy from the tube thru the air to the tissues breaks up the air, forming a wealth of ozone, and a small percentage of nitrous acid. The current seems to carry the ozone into the tissues, for after several hours, and repeated washings, the odor is still prominent at the point of treatment.

The nitrous acid is present in just sufficient quantity to irritate cell life to that extent, to set up a healthy action. The ozone favors a rapid oxygenation, which seems to be fatal to all germ life. While we have not yet laid the crime of eczema at the door of the bacteria, yet the success of this treatment would cause me

to lean toward that theory of cause. Its destructive power over germ life is very clearly shown in pus formation, such as boils, abscess, ulcers and pathological lesions due to pus organisms. The action over germ life is no doubt also due to the presence of ultra violet rays of light, while we know that the ultra violet ray will not penetrate a very thin crystal of glass, yet the vacuum tubes under excitation from the high-frequency apparatus does produce violet rays. Clinical tests would prove this, and again the positive test of the fluorescence of willemite shows the ray present and active. This chemical and light action of the high-frequency current is—well, we might call it the active principle of the application to skin diseases and other superficial lesions.

But experiments in using the high-frequency current shows an action from the current proper. This current will light a 16-candlepower incandescent lamp to a full glow. At the same time this can be passed thru the body, in circuit with the light, without any sensation to speak of. Now it is a fact that one-fourth ampere or 250 ma. of a steady current is required to light this bulb. This much current from the galvanic battery would be rapidly destructive; from the street current with only 110 volts it would be in many cases fatal. What is it we have here that so nullifies the action? Does the great frequency cause the bulb to glow under a small amperage? Or is there some condition present which so modifies the action of this large current that it can be passed safely thru the body? If the large amperage is present, where is its source? These are some questions to be solved.

That the high-frequency current has a destructive action was shown by experiments carried on by Bordier and Le Compt, who, in a report to the Academy of Sciences of Paris, showed that when applied to small animals death ensued. Application was made by metallic bands around the abdomen and throat. Paralysis occurred, followed by death a few days later. Upon application with one electrode in the mouth and the other in the rectum, death occurred with a rabbit in fifteen seconds, a guinea pig in seven seconds and a rat in forty seconds. D'Arsonval observed results which coincided with these. So we will see the need of proceeding with caution, and the importance of not using this modality indiscriminately. Some of the manufacturers of electrical apparatus are illustrating ways of using this current and proclaiming for it a "panaceal" value, if you will pardon the term. I think when the monopolar application is made, as most of us use the current in this country more for its chemical and superficial effect, it is absolutely harmless in any dosage. But the bi-polar application needs to be observed very closely, and in working out a technic I would advise its use in the same class of patients and conditions recommended for the static currents. I think without doubt the rapid frequency will prove a better means of relieving pain than any other mode; also the sparks will penetrate further and are less painful than the static sparks. We have in this high-frequency current great promise, and the near future will bring it rapidly to the front. I bespeak for it your earnest investigation.



## General Remarks on X-Ray in the Treatment of Cancer and as a Diagnostic Agent.\*

BY ROBERT S. GREGG, M. D., CHICAGO, ILL.  
Radiographer in Dr. Pratt's X-Ray Laboratory.

We see much today in the medical journals pertaining to the x-ray and its different fields of usefulness.

We note that it has become indispensable in the treatment of superficial lesions of the skin such as epithelioma or skin cancer, lupus, eczema, acne, etc. On the other hand we are forced to admit its very limited usefulness in deep-seated malignant conditions such as carcinoma of the stomach, liver, colon, etc. However, experience is the great teacher of the ages and I am quite sure we have had experience enough to teach us of the merits and demerits of the x-ray. The x-ray is not a panacea, as some would have you believe. Its greatest field of usefulness is probably in diagnosis. There are many disorders of the skin that are amenable to its influences and again there are superficial conditions wherein the x-ray is absolutely dangerous.

When we stop to consider the enforced metabolism which takes place under its influence, we are brought to a realization of the possibilities of danger as well as of cure, we are bound to respect the law of physiologic change or else suffer the consequences.

Judging from my own experience, carcinomata of long standing, with glandular involvement, do not heal under x-ray treatment. We have been able to minimize the pain, to some extent lessen the discharge and probably retard the growth of the tumor. But, on the other hand, we have no doubt hastened death by prolonged raying, especially of an ulcerated area where rapid destruction of tissue has

taken place beyond the power of the body to dispose of. We then observe a rapid metastasis, a consequent sepsis, and death.

I do not consider it advisable to treat with the x-ray carcinoma of long standing, such as we at times find in the mammary glands, where connective tissue contraction has taken place, because we are liable to stimulate the epithelium to renewed proliferation, and if left alone at this stage the patient will probably not die of cancer.

The x-ray has cured and does cure superficial lesions such as epithelioma of the skin or skin cancer, lupus, eczema, acne, and many others. Even psoriasis yields very beautifully, but whether it will return in every case as it seemingly does under other modes of treatment, in my experience remains to be seen. I am very sanguine in this regard. But for deep-seated conditions, such as carcinoma of liver, stomach, enteron, or colon we have no direct means of knowing just what is taking place. All we can do is to expose from day to day on the expectant plan. The treatment is a method of empiricism whereby we disseminate cancerous debris by a rapid destruction of tissue, and cause absorption of septic material with its dangerous consequences.

During my three years' experience with the x-ray in the treatment of superficial and deep-seated malignant conditions I have yet to know the first case of deep carcinoma which has been cured by x-ray. To be sure, patients have seemingly been benefited in uterine cancer inasmuch as pain has been reduced and discharge lessened, which has been a great source

\*Read before the Illinois State Eclectic Medical and Surgical Society, May 30, 1904, Chicago, Ill.



of relief to the patient, but beyond that I can not speak encouragingly.

I am inclined to believe that reported cures of deep-seated carcinoma by x-rays are cases of mistaken diagnosis.

I have watched very carefully superficial and deep malignancies under treatment and have known patients to succumb very rapidly from sepsis shortly after vigorous x-ray treatment was begun.

The conditions which, from my experience, I consider amenable and those which do not apparently yield to x-ray treatment will class as follows:

**Probable Cases.**—Epithelioma or skin cancer without metastasis, lupus, eczema, acne, etc.

**Possible Cases.**—Epithelioma or skin cancer with severe metastasis, carcinoma of mammary glands with metastasis, tuberculosis of joints and glands and psoriasis; Hodgkin's disease or sarcoma.

**Improbable Cases.**—Uterine malignancy, gastric malignancy, enteronic and colonic malignancy, hepatic malignancy.

Its diagnostic value is certainly its great redeeming quality. X-ray shadows are not false, it is merely a matter of interpretation, therefore experience is the paramount factor in making diagnosis from x-ray negatives as negatives are more reliable than reprints. It is really surprising how little one can actually see when examining an x-ray negative, no matter how well versed in anatomic structure, unless he has trained his eye and understands the character of the shadows different structures give.

For precise results much depends upon the apparatus, the amount of current, the x-ray tube, the position of the part to be photographed in its relation to the plate, the preparation of the patient where hepatic and ureteral calculi are in question,

length of time of exposure and character and vacuum of tube. In other words, only close application with appreciation of minor details and long experience will enable one to produce good results.

The fluoroscopic examinations are of the greatest importance in certain regions of the body, for diagnostic purposes, yet their value becomes practically nil in the regions where one would naturally expect to find renal, hepatic and vesical calculi. If the patient be very spare one may with some degree of exactness be able to arrive at an approximate estimate as to the cause. However, one must depend, for his absolute findings, upon the skiagraph. In cases of failure to find a shadow, repeated exposure should be employed.

Next in importance is the position of the part to be photographed. It is absolutely necessary that the part to be photographed should be in as close contact as possible to the plate. Otherwise it is useless to try and produce a good x-ray picture.

This rule applies particularly when you are looking for hepatic or ureteral calculi and it is not an easy matter to photograph these conditions.

In taking pictures for ureteral calculi it is necessary to elevate the shoulders and flex the thighs upon the abdomen. Sand bags are very efficient for the shoulders and a double inclined plane for the limbs. In this way you bring about a convexity of the dorsal surface which brings it in close contact with the plate.

In hepatic calculi the ventral surface to the plate is the position required. It brings the gall bladder in close contact with the plate. In this position the shadows are not diffused in being carried through the body, as would naturally be the case were they photographed in any other way.

The length of time for exposure depends upon the vacuum of the tube, the density of the part to be photographed and the power behind the tube. The higher the vacuum of the tube the greater the penetrating power and the quicker the decomposition of the silver salts on the plate through dense tissue and vice versa.

One must be governed by the corporeal dimensions of his patient and experience is the only teacher.

Developing is an art as well as a science, and the personal equation enters into this as into every other art. No single rule can be laid down that will meet with the precise requirements of every artist or operator. One must work out his own experience and apply his skill and knowledge to the best advantage from the facts at hand. We wish here merely to deal with the essentials as regard the needs from an x-ray standpoint. Distinct contrast and minute details are the two important features in a skiagraph, and for diagnosis of ureteral calculus *both of these are indispensable*. Plates should only be exposed in a dark room in the presence of a ruby light. A tray, preferably of vulcanized rubber or fiber, sufficiently large, should be used to handle the plate comfortably with just enough margin for removal and replacing them for examination while in the process of development. An adequate amount of developing solution should be freshly prepared each time, according to the size of the plate to be developed. The amount of solution should be sufficient to cover the whole plate at one time, so as to prevent unequal development. The temperature of the solution should be between 60° and 70° F. and the tray which contains the plate should be rocked occasionally to assure complete development.

X-ray negatives of abdominal and pelvic regions should be carried to almost complete opacity in order to bring out all details (and exposures of parts of lesser density in proportion).

After development the negative should be washed in clear water for a minute or so, in order to free it of all developing solution, and then placed in acid fixing bath until completely fixed, or, in other words, until the bromid or chlorid of silver salts unaffected by the light have been dissolved, changing the opaque parts of the plate into transparency.

The formula of the developer and fixing bath is as follows:

#### DEVELOPER.

Water, 16 ounces.

Tolidol (Pfabe), 40 grains.

Sodium sulfite, dried 45 grains; or crystal, 90 grains.

Potassium carbonate, dried 60 grains; or crystal, 75 grains.

Potassium bromid, 1/12 grains.

To prepare a stock solution it will be found convenient to multiply the above figures by three (3), using the same amount of water. The bottle must be well corked and filled up to the neck. For use, dilute each ounce of the developer with two (2) ounces of distilled water only. The formula for the stock then becomes (in the metric system):

Water .....	500
Tolidol .....	8
Sodium sulfite, crystals.....	18
Potassium carbonate, crystals....	15
Potassium bromid .....	.015

#### FIXING BATH (Pfabe).

4 ounces sodium thiosulfate,  $\text{Na}_2\text{S}_2\text{O}_3$  120

1 ounce sod. acid sulfite,  $\text{NaHSO}_3$ .. 30

16 ounces water ..... 480

The fixing bath will be in the neighborhood of 72° hydrometer test.

After complete fixing, the plate should

be washed in running water for at least an hour, or placed in a chemical solution known as "Pfabe" hyperfore (eliminator of hypo) for about ten minutes. After removal the film should be carefully rubbed off with wet cotton in order to remove the sand, etc., that may have settled on it during the washing, then place on an inclined plane to dry, out of the way of all dust.

An x-ray plate should be developed only by one versed or familiar with anatomic structure and physiologic functions.

What has x-ray photography taught us, or what has it disclosed?

In fractures it is an indispensable aid and the surgeon who today would set a bone without availing himself subsequently of the x-ray for verification or for actual diagnosis is certainly not doing his duty to his patient.

In lung and heart diseases we are able to tell much.

In diseases of the kidneys, especially sarcoma, it is of inestimable value.

In ureteral and vesicle calculi it is positive as to the presence or absence of a stone.

In hepatic calculi it is a great aid, but we can not positively differentiate the stones from the gall bladder itself, due to the fact that a gall bladder that is diseased offers as much resistance to the x-rays as the gall stones do. Consequently we get the shadow which corresponds with the gall bladder itself. The possibility of a burn is practically nil.

I would like to call to your notice a few cases of Dr. Byron Robinson of ureteral and hepatic calculi that were x-rayed in Dr. Pratt's laboratory and a diagnosis made from the shadows and confirmed by operation during the past two years and a half.

September 4, 1901. Mrs. S. was x-

rayed at three different times. Diagnosis, stones in the right pelvic ureter. Operated upon and three stones removed.

June, 1903. Girl, twenty-two years old, from Iowa, x-rayed and diagnosis of stone in the ureteral pelvis. The case was operated upon and the stone was found.

October 28, 1903. Mrs. H., of Chicago, was x-rayed and diagnosis of the stone in the right ureteral pelvis. Operated upon and the stone found.

April 4, 1903. Mrs. W., of Chicago, was x-rayed and diagnosis of a stone in the left ureteral pelvis. Operated upon and stone secured.

October 28, 1903. Mrs. H. x-rayed, stone in the right ureteral pelvis. Operated upon and the stone was secured.

November 10, 1901. A young woman, twenty-five years old, x-rayed and diagnosis of gall stones made. Was operated upon and a large stone was removed from common duct.

April 7, 1903. Mrs. W., fifty-five years of age, x-rayed and diagnosis of gall stones. Operated upon and fifty stones were removed from the gall bladder and common duct.

November 10, 1903. Mrs. C., forty-eight years old, x-rayed and diagnosis of gall stones. Operated upon and eight stones secured.

July, 1903. Mrs. W., twenty-six years old, x-ray disclosed a distinct shadow. Operated upon and secured a large gall stone from the pelvis of the gall bladder.

October, 1903. Mrs. H., of Chicago, x-rayed and diagnosis of stone in the pelvic spindle of the ureter. Operated per vaginam and stone secured.

September 30, 1903, and January 24, 1904. Will also report two cases of malignant kidney which were x-rayed and a diagnosis made of malignant kidney by the x-ray. Operated upon by Dr. Robin-

son and subsequent microscopic examination disclosed the fact that the disease in one case was sarcoma, the other carcinoma.

I still have several other cases in which the x-ray by repetition casts a shadow of definite contour, location and dimension. However, they have not been operated upon.

March 17, 1903. Boy, eight years old, a case of Dr. O. W. MacKellar, was x-rayed; diagnosis, vesical calculi. Operated upon and two large stones removed.

One has to be extremely careful in arriving at an absolute diagnosis of ureteral calculi, even where the shadows are present after being x-rayed, because there are other conditions in the same region which do cast shadows. As an example:

Dr. Byron Robinson sent a case in which he suspected calculus in left ureter. X-ray, repeated three times, showed five shadows in course of the left pelvic ureter. The case was operated upon by Dr. Byron Robinson and by exposing the entire left ureter demonstrated that these shadows were caused by phleboliths or vein stones and not calculi, as was supposed.

Before operating one should confirm the diagnosis of ureteral calculi from an x-ray standpoint by a complete history of same and also by ureteral catheterization. The diagnosis can be very successfully verified in this way where the stones are located in the pelvic spindle of the ureter, because they offer obstruction to the catheter.



**The Apostoli Treatment.**—G. Betton Massey (*Journal of the American Medical Association*, May 21, 1904) summarizes the final results of this method of treatment in some cases of uterine fibroids. His conclusions are as follows: (1) A prolonged observation of cases of fibroid tumors of the uterus under the Apostoli treatment teaches that three-quarters of the cases subjected to this method will be practically cured, as attested by inquiries made from three to sixteen years after the cessation of treatment. (2) The cases that responded poorly, or not at all, to this treatment are not harmed by it, when properly applied, and heroic measures may then be adopted with the certainty that milder means are of no avail. (3) Hemorrhagic and interstitial fibroids are

best adapted to the Apostoli treatment, while subperitoneal or degenerative fibroids and those complicated with pyosalpinx are least adapted to be relieved by it. (4) So far as the author's inquiries and circulars show, there have been but seven deaths among one hundred and ten patients during the sixteen years or less that they have been under his observation. It is an interesting fact, moreover, that but one of these deaths was due to the progress of the growth itself, proving the non-mortal character of this affection. Of the remaining six, one died long after treatment of an affection totally unconnected with the growth, one of septicæmia under electric treatment and four while under operation with the knife.—*Medical Record*.



## Electro Therapy.

A Course of Twenty-four Lessons under the auspices of the Chicago College of X-Ray and Electro-Therapeutics.

### Lesson 12—PHOTO THERAPY.

Light consists of electromagnetic waves, and its therapeutic effects are similar to those of rapid electric oscillations of any other kind, such as are found in the high frequency currents and the x-rays. The differences in the effects arise from differences in the form and frequency of the waves.

It is probable that in ordinary light, in the high frequency current, in the x-rays, and perhaps in the N-rays, we have waves of one principal form which, according to the vortex theory, is of the cylindrical type. Other forms which exist are the plane-polarized wave, in which the motion of the ether is in one line only, perpendicular to the direction in which the wave advances; elliptically polarized waves, in which each portion of the ether instead of moving to and fro in a single line moves in an ellipse, and of which there are two varieties, one right handed, the other left handed; circularly polarized waves, in which the ether moves in a circle and of which also there are two varieties; and finally compression waves, whose existence must be considered possible and probable, but of which we have as yet no experimental evidence. Therapeutically the form of the wave is of small importance.

All electromagnetic waves travel thru the ether at the rate of 300,000 kilometers per second. Thru masses of matter, whether in the solid, liquid or gaseous form, they travel more slowly, and the shorter waves are usually retarded more than the longer ones. White light consists of a mixture of waves of many different lengths. Each wave-length by itself corresponds to a certain color. The shortest visible wave is in the extreme

violet end of the spectrum; its length is nearly 400 bicones (micro-millimeters). The longest visible wave is the dark red at the other end of the spectrum; its length is 760 bicones. Thus the visible spectrum covers nearly one octave of color. Beyond the visible spectrum at each end are other waves of "dark light." Ultra-violet waves have been photographed of all lengths from 400 bicones down to 100, covering two full octaves of light, and there is no reason to think that the possible limit has been reached. At the other end of the spectrum, in the infra-red region, waves have been detected of all lengths down to 24,000 bicones or 24 microns, a distance of five octaves. The whole of the known spectrum of light consists of about eight octaves, of which less than one octave is visible.

Entirely beyond this photographic spectrum, and at a distance of eight or ten octaves from its longest waves, we place the Hertzian electromagnetic waves, whose length varies from a few centimeters to millions of kilometers.

The x-rays are supposed to lie beyond the ultra-violet. The place of the N-rays is unknown.

The general nature of the effects of ether waves upon the body are the same whatever the wave length. But certain rates of vibration affect certain tissues more strongly than others, owing to differences in their chemical and anatomical composition. Wave length thus becomes a consideration of great therapeutic importance.

Waves whose period of oscillation is such that their energy is all expended in any of the tissues do not pass thru those tissues, but are wholly absorbed in them.



Certain of these produce chemical changes, all the rest produce mainly heat. As suggested by J. Mount Bleyer, the phototherapist of the future will filter out all but the rays he wants to use in any particular case, and with this small remnant he will get the desired results with the least possible disturbance to the rest of the organism. In order to reach internal organs it is necessary to use waves of such a character that they are not chiefly absorbed near the surface.

Sunlight does not pass freely thru the body, tho it does so to some degree. The greater part of it is converted into heat in the epidermis and dermis. Hence the therapeutic action of light is greatest in diseases of the skin and of the parts adjacent to it. It has been found that excessive heating of the skin by sunlight is not advantageous, and that this can be prevented to a great extent by filtering out all the rays below the blue. The blue, violet and ultra-violet rays expend a much larger proportion of their energy in chemical effects and a smaller amount in heat. But in screening off the lower waves nine-tenths of the total energy of the light is often lost, leaving too little to be of much value.

Finsen adopted the plan of keeping the exposed parts cool with a stream of cool water, and in this way was able to make use of the full beam of concentrated sunlight or electric light for the cure of various diseases of the skin.

The most conspicuous chemical effect of ether waves upon the body is acceleration of the normal metabolic changes, which may be roughly summed up in one word—oxidation.

A mild stimulus to metabolism, such as is obtained from moderate exposure to scattered sunlight in summer, is a tonic. More intense light is irritating, producing

successively the well known stages of inflammation and culminating in some form of necrosis when the intensity becomes sufficiently great. The general nature of the effects are alike upon both normal and abnormal tissues; but abnormal tissues have less vitality, in other words, are in a less stable condition of chemical and physiological equilibrium, and therefore pass thru these changes more rapidly or with a less intense stimulus than normal tissues require. If, then, we apply the light with just enough intensity to injure and destroy tissues that are abnormal, taking care not to have such intensity as to seriously injure the normal, a cure is effected.

The plan of procedure is then very simple, namely, avoid excess of heat, use light with increasing intensity until the desired reaction is obtained.

It makes little difference whether the apparatus costs one dollar or a thousand dollars, so long as these two things can be done. Sunlight is the best when it can be obtained; but so long as we are unable to control the clouds it will be necessary to have on hand some other source of light. The electric light is practically the only one that is of sufficient intensity, and that can be made use of at a moderate expense. It has the advantage of containing a good supply of violet and ultra-violet rays, without which its therapeutic value would be small. The nearer the source of light is to the part to be treated the greater is the intensity of the treatment. If the source is removed to twice the distance the intensity of the light becomes one-fourth of what it was.

Sometimes the light is concentrated by passing the rays thru a lens so as to render the rays parallel. They can then be transmitted to any required distance with-

out much loss of intensity. Unfortunately, glass is opaque to most of the ultra-violet rays, and it is necessary to use a lens of quartz. The apparatus becomes much simpler and much less expensive when two quartz plates or lenses enclose a chamber thru which a current of cool water flows. The chamber is placed preferably in contact with the patient, with some pressure, so as to remove the blood and allow the rays to penetrate more deeply. The source of light is then placed as close as possible to the water-chamber, or the rays of the sun are concentrated upon it by means of either a large quartz lens or a concave metallic mirror.

Some experimenters advise the use of a powerful ray directly upon the surface to be treated, and used intermittently in order to prevent overheating. They claim for this treatment quicker results than by the Finsen method, which consists of a longer exposure under less intensity.

On account of the great expense of the original Finsen lamp, both in first cost and in operation, a number of smaller lamps for individual and local treatments have been constructed. These are ef-

ficient in proportion to the amount of light produced by each. An electric lamp requiring five amperes current is useful for mild cases. A lamp using fifteen to twenty amperes, and which can be brought close to the patient, has nearly the same efficiency as the larger Finsen apparatus.

The considerable work has been done in photo-therapy, except from Finsen's laboratory we have no very extensive and reliable statistics from which we may infer the value of this agent in different diseased conditions. There is no doubt of its value in the treatment of lupus, and good results are claimed in the earlier stages of tuberculosis of the lungs and of the joints. In some cases of malignancy the alternation of the x-ray with light has proved more effectual than either one alone. Careful experimental investigation is still required in order to determine more exactly the proper exposure under different conditions as regards the patient and the disease. Practically no harm has resulted from the experiments in photo-therapy, because when the treatment becomes injurious the patient immediately begins to object on account of the severe pain.

#### High Frequency for Lupus, Etc.

Dr. H. L. Henderson, Astoria, Ore., contributes to the *Eclectic Medical Journal* for March a report of the cure of lupus of the face, of fifteen years' standing, in seven treatments with the high-frequency apparatus excited by a static machine. A case of epithelioma of the eyelid, with an ulcerating surface the size of a dime, disappeared in seven treatments. Three large rectal ulcers disappeared after five treatments. A case of chronic ovaritis was cured in two weeks by daily treatments.

#### A Convenient Method for the Local Application of Dry Heat.

Cover the part to be treated—wrist, elbow, ankle, knee or body, with a Turkish towel to absorb the perspiration. Coil twenty yards of rubber tubing about the part to be treated and cover snugly with woolen cloths to retain the heat. Pass a stream of warm water through the tube, gradually increasing its temperature. A patient can stand all the heat that you can give him, if you do it right, and it's dry heat except for his perspiration.—*Alkaloidal Clinic.*

## The Cure of Consumption by Feeding the Patient with Subcutaneous Injections of Oil, and Its Digestion by the White Globules of the Blood.

BY THOMAS BASSETT KEYES, M. D.,  
OF CHICAGO,

Chairman of the First Organization Committee of the American Congress of Tuberculosis, and One of the Vice-Presidents of the International Congress of Tuberculosis, St. Louis, 1904.

By the method of treatment which I am about to describe in this paper I believe that consumption can be absolutely cured. First, however, before entering into the merits of this treatment, let us briefly consider the disease.

Tuberculosis is a disease of malnutrition, and while the presence of the germ confirms the diagnosis, before the germ can grow it must find a suitable soil, there must exist a pretubercular condition. It is estimated that we all breathe in a great many of these germs, but that they can not grow in a healthy, well-nourished individual. People who have consumption do not eat fats, oils and cream in sufficient quantities. The first requisite in an attempt to cure tuberculosis has been for many years to give the patient oils of various kinds, and the most successful sanitariums of late years have adopted a process of food forcing, using the fats of meats, butter and cream as the principal foods to be relied upon to effect a cure, each article of diet being selected for its fat-producing and strength-giving properties. To this a vigorous out-of-door life has been advocated, because why? It promotes appetite and the outdoor life is conducive to place the body in condition for the absorption of more fats. I was one of the first to advocate tent life for the treatment of tuberculosis in two articles entitled: "Camp and Outdoor Life as an Aid to the Permanent Cure of Tuberculosis, February 21, 1900," and "Some Results of Camp and Outdoor Life in North-

ern Wisconsin, Congress of Tuberculosis, May 15, 16, 1900," and some four years ago I located an out-of-door camp for the treatment of these invalids in Northern Wisconsin.

To maintain nutrition has long been considered the prime requisite of cure and an increase of weight is an indication that nutrition is overcoming the disease, and as weight increases there comes strength, and the passing away of the other distressing symptoms, such as the products of the disease, expectoration of mucus, fever and finally cough. Professor Osler has stated that the arrest and cure of the disease is entirely a matter of nutrition and that the whole object of treatment is to fortify the patient's constitution against the inroads of the disease so that the individual cells of the body have the stamina to fight against and destroy the tubercle bacillus. Regarding tuberculosis Dr. J. H. Elliot, in *Canadian Journal of Medicine and Surgery*, March, 1903, says that nutrition is dependent upon the proper assimilation of food, while improvement must be proportionate to the increase in the amount assimilated. All therapeutic measures, says Marfan, should be devoted to the end of nutrition and the earlier such measures are instituted the greater the prospect of cure. Without going further into the fact that the whole cure of tuberculosis, up to the present time, is dependent upon our ability to nourish the patient, except to say that the methods of Dettweiler, VonLey-

den and Hoffman, of Germany, depend upon results from nutrition, and to this end they have advocated forced diet regardless of appetite. If the patient was to recover he must eat. Out-of-door life was important inasmuch as it supplies to some extent the appetite.

Anorexia is one of the worst symptoms against the cure of tuberculosis. It is impossible to get the average patient to eat enough fats, and a person who has consumption is the one who leaves the fat from his meat, eats very little butter, and little of cream and milk. When a patient is far advanced in the disease he is unable on account of this loss of appetite and nausea, to eat sufficient food to maintain nutrition, and therefore gradually declines as the disease advances.

In the above few words I have tried to convey the importance of nutrition, in the cure of this disease, believing that the cure rests entirely upon our ability to so nourish the system and stimulate the cells of the body that they will throw off the disease.

*The Digestive Power of the White Blood Cells.*—Experiments have been conducted principally by the Italian physicians, and a few others, viz.: Gabrelschewski, arch. f. exp. path. 1891, bd. 28; Czerny, arch. f. exp. path., 1893, bd. 31; Leviertato, arch. Italiano di Clinica Medica, n. 3, 1893; Tarchettia e Parodi, La Clinica Medica Italiana, n. 10, 1899; Kraminer, Berl. Klin. Woch., n. 6, 1890; Oliva, Gazzetta Degli Ospedali, 17 giugno, 1900; Tarchetti C. Sull, esistenza di un fermento diastase nei corpuscoli bianche, Gazzetta Degli Ospedali, n. 90, 1900; Sull natura e sul significato della sostanza iodo-fila dei globuli bianchi, La Clinica Medica Italiana, n. 8, 1900; Di una pretesa degenerazione amiloidea sperimentale, La

Clinica Medica Italiana, n. 7, 1900; Ricerche sulla degenerazione amiloidea spermintale, La Clinica Medica Italiana, n. 11, 1902; Porcile V. sul valore semeiologico della reazione iodo-filia nei purulenti, Gazzetta Degli Ospedali, Milano, n. 102, 1900, which go to show that there is a glycogenic ferment in the cells which has the power to digest starches. These experiments have been carried on principally to discover a cause for the disease of diabetes. It has been shown more or less perfectly by some of these same observers that fats also may be digested by the blood, and that the white blood cells have the power of digesting oils. Though these experiments, according to Tarchetti, La Clinica Medica Italiana, 1900, are not definite, it is clear that the white cells of the blood possess a ferment or property which has the power of digesting fats and starches, and without going into the process, chemical, phagocytic, osmotic, etc., which has been gone into by Dr. Spezia in the numbers 5 and 6 of the Gazzetta Medica Lombarda, 1904, for as Tarchetti, Gazzetta Degli Ospedali, n. 28, 1904, says: "Is it possible to follow the rapid course of the oil injected into the internal organism and the phenomena positively chemical, of osmosis, of phagocytosis, and of digestion intercellular?"

Upon the digestion of oils by the blood I base this claim for a cure of tuberculosis. So far I have tried to show: First, That the cure of consumption must necessarily depend upon a proper supply of nutriment, the disease being primarily a disease of malnutrition. Second, That consumptives suffer so much from loss of appetite, nausea, and perhaps non-absorption, that, as a rule, they are unable to take sufficient amounts of fats to overcome the disease. Third, That the blood cells possess a ferment capable of digesting fats.

I shall now give my results in the cure of tuberculosis by the subcutaneous injection of oil. The oil which I have selected in the treatment of my cases has been olive oil of a very high grade, thoroly sterilized, using olive oil in preference to other oils on account of its being non-irritating and very readily accepted by the system. The point selected for the injection has been over the shoulder blades, injecting one day over one shoulder, and the next day over the other, excepting when a large amount of oil is used, when it is necessary to inject over both. There is very little pain connected with the injection and the following day it is hardly possible to find where the injection was made. By being careful in my technique of cleanliness and sterilization, so far no infection has taken place and consequently no soreness, though I believe the non-irritating properties of the oil have a great deal to do with this. The amount of oil used varies. I commence by injecting 12 cc. of oil each day and the third day increase the amount to 24 cc. of oil. If no unpleasant symptoms arise I keep gradually increasing the dose to full tolerance of the patient, which varies with the individual and the stage of the disease. Those who are poorly nourished will sometimes assimilate large quantities of oil up to about 200 cc. daily. In this manner I have treated nine consecutive cases successfully, and within twenty-four hours after each treatment there is a remarkable benefit and amelioration of all symptoms, such as diminished morning cough, night sweats, increased strength, and finally gain in weight. Some of the very worst cases of tuberculosis, under this plan of treatment, have gained each day and I believe have been thoroly cured. The syringe which I use is an aspirating

syringe reversing the piston with a thumb screw, it requiring considerable pressure to force the oil under the skin.

By injecting oil thus it is absorbed and assimilated by the blood cells and there is a great increase in their numbers. Thus all of the indications for the cure of tuberculosis are met. It overcomes the disease thru increased phagocytosis and thus the active cells destroy the disease. Nutrition is re-established. The time required to overcome all symptoms is remarkably short and one will be greatly surprised at the benefits which come with each treatment. Physicians should use great care in the amount of oil given, for very large doses, if long continued, might result in fatty degeneration of certain organs, but with the disease (tuberculosis) this is not so apt to occur, as tuberculosis and fatty degeneration are antagonistic. I have based the claims of this treatment as a cure for tuberculosis from my experience and clinical evidence and from my conviction. I give my results this early, believing that the cure of tuberculosis is solved and that by so doing many lives will be saved. Of course, to the above treatment should be added all that has been found useful in the treatment of tuberculosis, principally of which is a forced diet of articles selected for their nutrition, such as meats, fats, butter and cream, out-of-door life, and hygiene.

I hope and trust that physicians will at once take up this method of cure and I respectfully request that those doing so will communicate their results to me, as by broader knowledge much good may come and it is my desire to report these results at the International Congress of Tuberculosis, to be held in St. Louis this year.—*Pacific Medical Journal*.



## A Brief Review of Radium.

BY HENRY E. WAITE, M. D.

Let us not approach the consideration of this most recent addition to therapeutics with the blind faith of those who would believe that with the discovery of this new substance comes the dawning of the day when the blind shall be made to see, the lame to walk, when we shall mark the passing of all diseases due to parasites and bacteria, when tuberculosis shall be as a thing that was, and when the cure of cancer—that goal toward which modern scientists so earnestly strive—shall be an accomplished fact beyond doubt or peradventure.

Nor yet should we view it with the skepticism of those who, having suffered failure in inappropriate cases, would forthwith banish it to the limbo of the many measures previously exploited which have been tried, but have been found so woefully wanting.

Let us rather regard it with a sane, calm and impartial judgment, appreciative of its limitations, but keenly alive to its marvelous possibilities. While we may not as yet have a slingshot sufficiently powerful to slay outright the Goliath, disease, we may perchance be in possession of an arrow, which, skillfully directed, may pierce a vulnerable spot.

So numerous have been the articles appearing in both scientific journals and the lay press that radium has become almost as familiar a term as sapolio, and a brief mention of its physical properties will, therefore, suffice.

As Dr. Hedley says, in this substance we seem to approach the border line where matter ends and force begins. Indeed, one theory assumes that radium is a metal in a transition state, which may eventually establish a new atonic equilib-

rium and assume again the common properties of a metal.

To Professor and Mme. Curie belongs the credit of priority of discovery of this new element, for an element it has been proven to be by the spectrum analysis. By tireless effort they extracted from many tons of uranium residue, obtained from pitch-blende, two decigrammes per ton of a product of enormous radio-activity. Radium bromid is the strongest salt, but only infinitesimal quantities of this have thus far been produced.

Radio-activity is rather arbitrarily expressed in figures. Uranium is taken as unit strength and the radio-activity of radium is represented by 1,000,000. Upon this basis the preparation of radium thus far used for medical purposes would be said to have a radio-activity of 1,000 to 19,000. In some instances, however, the question of the radio-activity of a given specimen is a mooted point. I call to mind one instance in which the proud possessor fondly imagined himself to be experimenting with a specimen of a radio-activity of 20,000, which, upon careful testing, proved to be but 600!

A peculiar property of radium is that it is able to maintain its own temperature at 2° to 3° F. above the surrounding air without deriving its heat from any apparent source. Various theories as to the cause of this have been formulated, but as yet none of those advanced are entirely tenable.

The emanations from radium are divided into three groups, and although they resemble Röntgen rays to some extent, they are in other respects dissimilar. The classification is as follows:

$\alpha$ -emanations not affected by an ordinary strong magnetic field and incapable of passing through any but the very thinnest material obstruction. Altho of very much less penetrating power than the next group, they have about 1,000 greater energy.

$\beta$ -rays, analogous to kathode rays, are deflected by a magnetic field, have greater power of penetration and are projected from radium with a velocity approximating that of light.

$\gamma$ -rays are the most penetrating of the radium emanations and are analogous to Roentgen rays. They are considered as vibrations of the ether, produced by the sudden arrest of the electrons, the "kathode stream," coming into contact with solid matter.

Deflectable emanations affect a screen of barium platino-cyanid strongly, and of zinc sulf. only slightly; the non-deflectable positive atoms ( $\alpha$ -rays) have comparatively little effect on the platino-cyanid, but powerfully affect the zinc sulf. If a particle of radium nitrate be brot to bear upon the latter and the surface be examined with a lens magnifying about 20 diameters, numerous bright scintillations will be seen, due probably to the bombardment of the screen by positive atoms projected from the radium.

Investigation has shown that emanations from radium have the power of discharging electrified bodies; they also possess photographic and flourescent effects, an oxidizing action and the power of converting oxygen into ozone. An article in a recent journal demonstrates that the different components of this complex radiation possesses these powers in varying degrees. It is stated that  $\alpha$ -rays coagulate electrically negative colloids, and dissolve positively charged colloids, while  $\beta$  and  $\gamma$

rays produce chemical changes and oxidize tissues.

The power of discharging electrified bodies is an easy test for radio-activity. A stick of sealing wax rubbed on flannel is capable of attracting pieces of thin paper, but if the rubbed sealing wax be passed over radium this power is lost.

It is claimed that the emanations from radium have a bactericidal effect, it being shown in many instances that the organisms were killed in those places where they had been exposed to the action of over 10 milligrams of radium bromid. The organisms so affected were bacillus coli communis, bacillus liquefaciens and bacillus prodigiosus.

Concerning the physiological effects of radium not much is definitely known. It will produce luminous effects upon the closed eye, supposed by some to be due to flourescence of the membranes and by others to an action on nerve centers. It is this fact which has led to the exaggerated claims of the usefulness of radium in blindness, none of which have as yet been substantiated. There is no virtue in radium to restore sight, although it may be employed as an indication whether, as in cataract, the optic nerve is or is not intact. Other methods are, however, at our command for the same purpose, and, indeed, the danger attaching to the promiscuous use of radium for such purposes will preclude the possibility that it will ever become very extensively employed for this except in the hands of experts.

Burns similar to those of x-rays are produced upon the skin, the muscles being more resistant. It has been observed that atonic ulceration, lasting five or six months, has been produced by too prolonged exposure to radium. So, even though it should become cheap and abun-

dant, unless means are devised for the mitigation of this danger, its use must still be restricted to certain well-defined cases.

Entering now upon the discussion of that which concerns us more directly, i. e., the therapeutic effects of radium, these must of necessity vary with the radio-activity of the salt used, the method of its application, the condition of the part, the length of the exposure and the distance from the surface treated.

Two methods may be employed according to the nature and requirements of the case; short and repeated exposures and prolonged applications producing ulceration.

Experimentation with this new substance is still in so crude a stage that there is as yet no great variety in the method of application. The salt has usually been put up in a glass tube and the application made by holding the tube to the skin. As further work is done along this line it is quite probable that many other and more convenient, accurate and effective methods will be suggested.

As to the theory of its action, Exner and Holzkecht consider that "radium rays irritate the cells of the strata of the skin less vehemently than they irritate the cells of cancer and sarcoma. The latter are brought to necrosis before the other tissues suffer severely from the effects." Others hold that we have in the various forms of radiant energy the power of checking, or of attenuating, or of rendering the tissues resistant to the growth of certain parasitic organisms.

The number of those who are experimenting with radium is large, but up to the present the percentage of authentic cures is small. Many there be who rush into print with incomplete details, but with fantastic theories, and we would do

well to weigh the evidence carefully before deluding ourselves with the idea that we have here an agent more powerful for good than subsequent developments may prove it to be.

Current literature reports a number of cases of lupus in which radium has been curative. Dr. Danlos, of the St. Louis Hospital, Paris, is inclined to be rather more conservative. He states that while it looks as though radium would cure lupus, and that there is every reason to believe that it may do for lupus all that the Finsen light will do for it and do it more quickly and simply, still there have been some relapses and some failures, and he considers it too early to make sweeping statements which may only arouse false hopes.

Cases of psoriasis, rodent ulcer, melanosarcoma, carcinoma and epithelioma are also reported, in some of which the results would seem to be brilliant and encouraging. There is, however, a lack of uniformity and a paucity of detail which would engender the hope that experimentation might be conducted under more definite conditions, on carefully diagnosed cases, and that the radio-activity of the salts employed might in each instance be given, so that the data might be of more practical value.

It would seem that radium should be especially valuable in the treatment of deep-seated malignant growths inaccessible by other means, but experience seems to show up to the present that for the treatment of superficial lesions in accessible locations, the x-ray is equal, if not superior, to radium, the treatment by x-ray having the additional advantage that the exposure required is only two or three minutes, while an equal effect from radium requires an application of at least half an hour. Dr. Abbe mentions a com-

parative test in the case of a man attacked with epithelioma simultaneously in both ears, one of which was treated with radium and the other by means of the x-ray. A cure followed in each instance, the only difference being in the length of time required for treatment.

We may no more hope to cure every case of cancer by means of radium than we may hope to cure every case of headache by means of the correction of errors of refraction, and we are still face to face with the fact that we have not yet found that cure—all so earnestly sought, but that radium will only cure in some instances and that we will still continue to meet cases not amenable to treatment by radium or anything else.

In view of the fact that the emanations from radium have been shown to have a certain bactericidal effect, the ground has been taken that radio-active air taken into the lungs should prove effective in the cure of tuberculosis. It may be that the theory will stand analysis, but as yet we have no definite data upon which to base conclusions.

The study of this fascinating element is as yet in its infancy and it is quite probable that within the next few months numerous startling theories may be advanced, many of which will doubtless be speedily abandoned as unsound, but let us hope that with the lapse of time there may be the promulgation of sound theories and that conscientious and painstaking experiment and clinical data may show that we have in radium an invaluable addition to modern therapeutics.—*The Electric Review*.

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**The Use of Radium in a Case of Rodent Ulcer.**—J. A. B. Hammond reports (*British Medical Journal*, April 23,

1904) the following case: The patient was a man of eighty-five years, and was suffering from rodent ulcer. When first seen by the writer it was the size of the top of a teacup, but limited to the area supplied by the second division of the fifth nerve. It was determined to try the effect of radium bromid. A small tube of 5 milligrams was used. Treatment was begun by giving an exposure daily of fifteen minutes, holding the tube within half an inch of the ulcer, without any screen, and slowly moving it over the surface. After four or five days, altho there were no visible effects, the patient said the pain was less troublesome; and the exposure was then given twice a day. The discharge which had been considerable, rapidly decreased. The granulations were more healthy, but the edges of the ulcer remained unaffected. The patient finally refused to be bothered with any treatment at all. Since then the ulcer has spread deeply, the pain increased, and the discharge returned. This proves that even in such a desperate case as this, radium has a distinctly beneficial effect.—*Medical Record*.

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#### **Treatment of Cancer with Radium Bromid.**

Mr. H. G. Plimmer, of the Lister Institute of Preventive Medicine, relates, in the *Lancet* of April 16, the results of experiments carried out by him, with radium bromid on seventeen cases of cancer at the Cancer Hospital, London. The amount of radium used for these cases was 30 milligrams. The cases made the subjects of experiment consisted entirely of carcinoma, many of them being in a very advanced condition. The individual exposures varied from forty minutes to five minutes, and the capsule containing the radium was placed directly on the nodules or lumps, the only thing intervening be-

tween the radium and the skin being the talc top of the capsule. The cases were left for a month after the exposures and then examined. The effects in all the cases were negative, either no change or an increase in the size of the nodules. The effect on the skin varied in the different cases; an exposure of ten minutes was generally sufficient to produce blistering, and then scabbing, and under the scabs there was found a very slowly-healing ulcerated surface. The radium had apparently no effect with regard either to causing or relieving pain, and the irritation of the blisters was slight. From three of the above patients, who died, some of the nodules which had been treated were excised and subjected to a careful microscopical examination. In all these cases no change was found either in the cancer cells or in the fibrous tissue and none were degenerated. There appeared to be an increase in the amount of the subcutaneous rounded exudation which was greater in amount in those nodules which had been more recently treated, but the irritation of the skin would sufficiently account for this. Dr. Apolant, writing from Professor Ehrlich's laboratory, records, in a recent number of the *Deutsche medizinische Wochenschrift*, some very satisfactory and striking results obtained by treating very rapidly growing nodules of inoculated cancer in mice. Professor Exner, in Vienna, arrived at similar results in a case of melanotic sarcoma with multiple rapidly growing nodules in the skin. Mr. Plimmer says "it appears as if the emanation from radium can only act upon young and rapidly growing cells, and that older cells, especially if surrounded by fibrous tissue, are less and less easily affected, and if there be an excess of fibrous tissue the cells are not at all affected."—*Medical Record*.

#### Radium and Terrestrial Heat.

Professor Rutherford, of McGill University, Montreal, in a lecture before the Royal Institution in London, has advanced the striking theory that the earth's heat is not attributable to a molten mass which has been slowly cooling for a million years, which has been the generally accepted theory, but to the presence of radium. Professor Rutherford's address was listened to by a distinguished audience, including Lord Kelvin, Lord Rayleigh, Professor Dewar and other great scientists. Professor Rutherford was the first to measure the mass and velocity of the electrons of radium. He announced the probability of radium being contained in all matter.—*Electrical World and Engineer*.

#### Effects of the Roentgen and the Radium Rays on Cell Division.

—Perthes claims (*Deutsche medizinische Wochenschrift*, April 28, 1904) that both of these rays have a well marked inhibitive effect on division in both animal and plant cells. Observations made on the developing eggs of "ascaris" show that the x-rays exert a distinct harmful effect, independently of whether nuclear division has begun or not. The damage does not appear at once, but comes on later as cellular division proceeds, and is marked by an irregular course in the development and the production of abnormal end products. Analogous results were obtained when the radium rays were employed. Exposures of growing plant roots to the influence of both varieties of rays also disclosed a marked inhibitive action on their growth. The author suggests that the effects are due in all probability to the production in the living cell by the rays of substances which damage the chromatin in the nucleus.—*Medical Record*.



**Effect of the X-Rays on the Internal Organs.**—H. Heinecke (*Münchener medizinische Wochenschrift*, May 3, 1904) in some experiments made about a year ago, found that small animals exposed to the rays for a number of hours, died in from seven to fourteen days. The spleen showed an excessive increase in the pigment, a disappearance of the follicles, and a destruction of the splenic pulp. More recently he extended his experiments and exposed a larger number of animals of about the same size. He then found that it was possible to separate entirely the processes in the follicles from those taking place in the other parts of the spleen. The former started a few hours after beginning the radiations and were completed in twenty-four hours. The nuclei of the lymphocytes in the follicles disintegrate within a few hours and the remnants are taken up by the phagocytes, which shortly disappear from the spleen. This results in an almost complete destruction of the follicle. Analogous processes are also found to take place in all other lymphoid structures of the body. In the marrow similar processes occur. When larger animals, such as the dog, were employed for the experiments, the same results were obtained, except that the time was slightly prolonged. It was determined that the minimum length of time required to bring about these changes was fifteen minutes in rabbits or a moderate size dog. For these short exposures the amount of destruction is limited and repair can undoubtedly take place. These experiments show that there are cells in the body which react to the rays much more quickly and delicately than the cells of the epidermis. The author believes that similar effects take place in man, and that the lymphoid structures are affected without there being any marked reaction

in the skin. He therefore claims that a therapeutic application may be made of this principle in treating certain diseases of the lymphatic system—leukæmia, pseudo-leukæmia, malignant lymphomata and lympho-sarcomata. It may also prove of value when the disturbances are due to an abnormally large thymus. He has not made any use of this method himself, but in a footnote refers to cases of leukæmia thus treated by American surgeons.—*Medical Record*.

#### **Radio Therapy in Pulmonary Tuberculosis.**

Karl F. M. Sandberg, Chicago, (*Ill. Med. J.*, March) after a very complete tabulated resumé of the results of x-ray treatment of nearly fifty cases of pulmonary tuberculosis, from the earliest cases treated by Pratt in America and Rendu and Du Castel in France, down to the present time, presents the following conclusions from his survey:

1. No ill results, that clearly can be traced to the effects of the x-rays, have been observed, x-ray burns excepted.
2. Beneficial results have apparently been obtained in a considerable number of cases.
3. The fact that many cases, especially in the latter stages of the disease, have not shown any improvement, not even retardation of the disease, does not detract from the merits of the remedy any more than it detracts from the merits of all remedies previously used.
4. The x-ray treatment should be valued as one of our most efficient remedies in tuberculosis of the lungs, but should not exclude the use of other remedies.
5. The greater uncertainty of the effect of the x-rays on tuberculosis of the lungs, as compared with the effect of tuberculosis of skin, glands, peritoneum and joints, can easily be explained by the ob-

struction placed in the way of the rays by the ribs, an explanation that carries with it a suggestion, namely, resection of the obstructing ribs in appropriate cases before the use of the rays.

6. It would seem that an instrument of medium intensity and medium length exposures carried on for a considerable length of time—months—have given the best results.

#### **Hypnotism in the Treatment of Chronic Alcoholism.**

Hypnotism has been used for some time now in the treatment of confirmed inebriates. Those who have had experience of this form of treatment report satisfactory results. Dr. Milne Bramwell, in his recent work on hypnotism, states that he has treated during the past twelve years seventy-six cases of chronic alcoholism by hypnotic suggestion, and has obtained the following results: Cured, twenty-eight; much benefited, thirty-six; unaffected, twelve. Some of the best results have been with women, a contradiction of the popular theory that women are incurable. Dr. Creed, of Sydney, New South Wales, has recently drawn up a report on drunkenness and its prevention and treatment in that colony. He insists upon the virtue of hypnotic treatment, and urges that the treatment should be tried in the public institutes of the colony, as

well as in private practice, and he is confident it will be found to cure a large proportion of drunkards.

Dr. Charles Lloyd Tuckey, writing in the *British Journal of Inebriety*, April, gives the following as his conclusions reached by a close study of the matter: (1) Most alcoholics are good hypnotic subjects. (2) To insure reasonable prospect of success, the patient should have a real wish to be cured, and should be placed under favorable conditions while undergoing treatment. (3) He should be kept under observation for at least a year, during which time he should feel himself on probation. In the opinion of Dr. Tuckey the treatment has these advantages:

(1) It is rapid in action. After two or three sittings there is generally a marked improvement in the patient's general mental and moral condition. (2) The patient is able to continue his business, and is thus saved the expense and loss incurred by confinement in a retreat. Domestic ties are not broken, and the demoralization which often results from the enforced idleness and evil companionship, almost inseparable from life in a retreat, is avoided. Suggestion should aim at two objects—absence of craving and even physical repulsion toward alcohol, and increase of power of resistance and restoration of self-control.—*Medical Record*.



## Suggestion in the Cure of Consumption.

BY DR. EUGENIE R. ELISCU.

1519 MADISON AVE., NEW YORK.

In the rational treatment of consumption there are a few important factors to be considered besides proper food, air and surroundings.

The first step is to inoculate, not only the mind of the sufferer, but the public at large, with the conviction that consumption is a curable disease.

Second—That not the disease is to be treated, but the individual.

Third—That Mr. Optimist will recover more speedily under Dr. Altruist's care than Mr. Pessimist.

Fourth—Nature demands the survival of the fittest. And who is he? The one who fits himself with the power of will to conquer in the battle of life. Therefore success does not depend only upon what kind of food, air or exercise one uses, but upon our own desire and will as well as upon the suggestion from within, or without, the bulwark of all therapeutic systems.

In the primitive or savage state, when man led a natural life, breathing pure air, we have no reason to assume that consumption was his companion. Even if the savage passed his nights in some spacious but clean cave, probably there was no one else to pollute or share with him his rocky bed. Besides, with the dawn of day necessity drove him out to exercise his limbs and lungs in search of food, and thus kept him well. While today civilization has unfortunately driven us away from the caves of mother earth into non-aerated and sunless dens, so-called modern flats, there, *en masse*, to send us into early graves by a continuous rebreathing of foul air. These dungeons or pest holes we call human habitations, and then won-

der why consumption and other diseases appear here and there to relieve the congestion, as well as to point out our great social and individual sins. In our selfish ignorance we have forgotten that you and I and all of us are our brother's keepers.

Humanity is a chained unit. If one individual link in the social structure is impaired, sooner or later one by one is doomed to undergo the same fate.

Consumption is a social problem and requires a social remedy. This cancerous growth prevails mostly among the ill-nourished, underfed lower flora of society (the victims of the crowded tenement districts), from whence it spreads its miasmatic poison to the fauna of the upper social structure, polluting the perfume of the high-fenced roses, proving that no one is safe as long as it exists. Nature righteously takes her course and reminds us that unless man will learn to love himself as well as his neighbor he can not hope to exterminate the consumption of hearts, lungs, minds and souls. Suggestion and auto-suggestion are seldom mentioned as causes, but often observed by the general practitioner.

Now we come to the microbic cause—the bacillus tuberculosis. Previous to the era of the microscope we knew nothing of its existence, but ever since we have given it so much importance that from the micro it has grown to a giant macro and rules everything else out. No physician of repute now dares to make a positive diagnosis of consumption unless the board laboratory reports tubercle bacilli. Much less would one dare pronounce a case cured, even in the presence of all the symptomatic evidences of health, until the

board says no germs are found. Bearing this in mind, we think we ought to know something of this much-scrutinized monster.

If the microbe were the chief cause, as by most believed, why by all our daily exposures do so comparatively few contract consumption? Many a consumptive dies without the tubercle bacilli being found in his organs; many a healthy man entertains the germs and still lives. This proves that the cause is not the microbe without, but the man within. Therefore, instead of hunting them down and seeking a counter-poison to kill-cure, two at one shot, let us leave the old beaten track and start anew to learn how to fortify the system against the plague.

Reviewing all the causes and the many disappointments met with in the endeavor to stamp out this disease, it is no wonder that in the mind of many a physician and of the public it is held to be incurable. Yet in the face of all the failures, man, with a bulldog tenacity of faith, hopes against hope to cure an incurable affliction.

From a psychological point of view the question arises, from whence this unreasonable optimism in our hearts? The medical profession gave it its death blow by declaring it incurable. At the same time the profession is still searching for a cure.

Tuberculosis is a culmination of working causes. Remove these and nature will help you to effect a cure. How? By constantly suggesting right thoughts, right living, breathing, eating, dwelling, schooling, marrying, child-bearing, thus curtailing the inner and outer causes. The tubercle, not finding suitable pabulum on which to thrive, will have to die a natural death.

Man's body, the finest living machinery,

made up synthetically from heterogeneous protoplasm, chemically analyzable into elements, microscopically known as a cellular mass, still challenges science to explain the grand processes which continually elaborate the phenomena of life-energy and the manifestation of mind. Man as a complex unit governs his body by means of the brain centers, from whence the invisible force, mind, imparts through the nerve filaments temporary intelligence into each individual cell, receiving in return information as to its condition and requirements. Thus the mind influences and controls the bodily functions. Through the knowledge of hypnotism we also learn that this invisible energy functions on two planes, the objective and subjective, and is amenable to what has been termed suggestion; particularly when the subject is in the passive or psycho-hypnotic state. Through these comes our power of healing.

Suggestion when oft repeated becomes a mental picture impressed upon the sensitive cell plates of our memorizing faculty, from whence it proceeds to manifest, as a part of us, building up or destroying according to the vividness and nature of the suggestion. Suggestion, the moral, mental, physical impetus right, accelerates or inhibits our emotions of body and mind, and thus produces changes in the tissues, organs and vital metabolism.

Often I am asked, Will suggestion or hypnotism grow a new lung? No! Man does not wait to die with both lungs gone, but anticipates that climax. The autopsy table discloses hundreds of cases of persons who reached old age though considerable portions of their lungs were gone. What suggestion does and will do is to stimulate bodily repair by addressing the mind, be it in the waking or psychic state, to direct its invisible accelerating force to

the part, organ or tissue requiring help and thus check further destruction. It has this advantage over medicine: it is harmless and non-depressing. All it requires on the part of the patient is to live an hygienic, natural life, securing plenty of fresh air, proper nourishment and willingness to co-operate with the physician. The physician must not neglect the education of the patient in regard to general and thorough hygiene, otherwise it will only be doing half duty. By the aid of hypnotism we implant and impress post-hygienic suggestion, and by it help the patient to a speedier recovery.

To go into descriptive details as to methods of psychologizing and treatment would require too much time; but will briefly say that as a basis of success the operator must be an individual with strong will power, and must have a thorough knowledge of human nature, in addition to his medical training. This must be coupled with a strong moral conviction and firm resolve to do what is right, and he must learn to vividly impress upon his patient the suggestions he wishes to be realized. Of course, success largely depends upon the susceptibility of the patient and his willingness to act in accordance with surroundings and circumstances, for suggestion will not nourish a body that lacks food or that must breathe foul air. These do not supply what the nature of a healthy body requires. Again, some operators meet with more success than others; this depends upon the individual. But suggestion and hypnotism in the hands of a skillful, conscientious operator are powerful therapeutic agents for good, not only in curing functional nervous diseases right, but also those of organic origin. To my knowledge no other physician has ever claimed to have cured tuberculosis, this being an

organic disease, by means of suggestion and hypnotism. Yet I have used and am using it in both tuberculosis and mental diseases with most happy results. For years I watched and waited to see these results, in order not to prematurely hold out a hope to those poor sufferers, but after long experience I conscientiously feel warranted in bringing them before the profession, leaving investigators to judge for themselves.—*Suggestion.*

#### Differential Method of Observing N-Rays.

MACE DE LEPINAY.

A description of a contrast method, by means of which a number of people who could not observe n-ray effects before have now been enabled to confirm them. The method is based upon Blondlot's observation that the impact of n-rays changes the distribution of the radiation from a sulfid screen, increasing it in a direction tangential to the surface. The author mounts two strips of sulfid close together, one of them being a narrow line 2 mm. thick, and the other a strip 25 cm. long, but inclined at an angle of  $1^\circ$  to the line of vision, so as to appear about the same thickness as the former. The two strips are mounted in such a manner that they appear to form the figure 7, the oblique branch being viewed normally. The strip viewed tangentially is made somewhat more luminous than the other, so that the two strips appear equally bright under normal conditions. If now they are simultaneously exposed to a source of n-rays, such as a sounding body, the strip viewed normally is seen to shine out, while the other darkens and sometimes disappears altogether. It is possible, and even advantageous, to employ a luminosity much greater than that ordinarily used in n-ray experiments. The surface viewed tangentially must have a very fine grain.



The best way of mounting the sulfid powder is to fix it by means of collodion or a rubber solution on a copper plate slightly roughened by an electrolytic deposit. Radiation from one surface to the other must be intercepted by means of a lead screen.—*Comptes Rendus*, March 28; *Lond Elec.*, April 15.

### Illustrated Review of Physiologic Therapeutics.

The second quarterly number of this journal, edited by Dr. S. H. Monell, announces the conditions of a prize essay competition on x-ray methods and results. Twenty-five prizes are offered. The first prize for the best essay is \$1,000; the second, \$200; the third, \$50; the fourth and fifth, each \$25, and the remaining twenty, \$10 each. Not less than three hundred essays must be entered for competition, and no author of a book on x-rays can compete. The conditions of the contest are, first, that each one must be a subscriber to the *Review* (\$6 per year). Second, two typewritten copies of the manuscript must reach the office of the *Review* at No. 19 East Sixteenth street, New York, N. Y., by September 15, 1904. Manuscripts must be unsigned and marked with a figure for identification. A duplicate of this figure, with the author's name and address, must be sent in a separate, sealed envelope. The subject may be selected and treated in whatever way the writer thinks best. The essays are not limited to any particular length. Photographs of methods will be given more weight than the "before and after" style.

The publishers of the *Review* hope that this competition will bring together a large number of the latest and best results in laboratory work on the x-ray.

The *Review* is beautifully illustrated and is filled with selected articles, most of which have appeared in other journals during the last few months. Dr. S. H. Monell contributes a paper describing the x-ray compression and focusing cylinder for accurate radiography. This is a short lead cylinder with a diaphragm, mounted in a frame which is attached to the table and carrying a tube holder. The cylinder acts as a double diaphragm to cut off all extraneous rays, and as a compressor for holding steady the part to be photographed. The tube holder allows of a measured horizontal motion of the tube, enabling stereoscopic radiographs to be taken with accuracy and ease. Numerous illustrations are given of the apparatus, and much greater clearness in the radiographs is claimed when this method is used, but no examples are given to illustrate the claim.

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